

What Is Claimed Is:

1. A system for assisting in the automated docking of two space vehicles, one being a target vehicle and the other being a chase vehicle, the system comprising:

three antennas located at spaced-apart positions on a first one of the target vehicle and
5 the chase vehicle;

an antenna located on a second one of the target vehicle and the chase vehicle;

an RF transmitter contained within the second vehicle, the transmitter being connected to the antenna located on the second vehicle, the transmitter transmitting RF signals via the antenna;

10 three RF receivers contained within the first vehicle, each of the three receivers being connected to a different one of the three antennas located on the first vehicle, at least one of the receivers receiving RF signals from the transmitters via the antennas;

a processor receptive of signals received by the receivers;

wherein the transmitter transmits RF signals via the antennas on each vehicle to one or
15 more of the three receivers and wherein the processor is operative to determine, based on the received signals, the range and angular position of the chase vehicle with respect to the target vehicle.

2. A system as defined in claim 1, further including a communication link between the chase vehicle and the target vehicle.

20 3. A system as defined in claim 2, wherein the communication link includes a transmitter and antenna on the first vehicle and a receiver and antenna on the second vehicle.

4. A system as defined in claim 3, further including one or more video cameras located on the first vehicle containing the transmitter of the communication link and wherein the communication link passes information including video information to the second vehicle.

5 5. A system as defined in claim 4, wherein command information relating to at least one of the video cameras is passed via the communication link.

6. A system as defined in claim 2, wherein command information is passed via the communication link.

7. A system as defined in claim 6, wherein the command information includes a
10 signal related to whether the chase vehicle should continue the docking process.

8. A system as defined in claim 1, further including one or more video cameras located on one of the vehicles and wherein video information from the video cameras is passed to the other vehicle.

9. A system as defined in claim 8, wherein the video information passed from the
15 other vehicle is displayed in the other vehicle.

10. A system as defined in claim 1, wherein the RF signals are L-Band RF signals.

11. A system as defined in claim 1, wherein each of the transmitters transmits a differently-encoded RF signal than the other transmitters.

12. A system as defined in claim 1, wherein each of the receivers can
20 simultaneously receive RF signals from each of the transmitters.

13. A system as defined in claim 1, wherein the second vehicle further includes at least two more antennas located thereon and two more RF transmitters contained therewithin

and further wherein the three transmitters transmit RF signals to each of the three receivers and the processor is further operative to determine, based on the received signals, the relative angular attitudes of the two vehicles.

14. A system as defined in claim 13, wherein the first vehicle also includes an RF
5 transmitter to send information to the second vehicle, the information including a known repeating code and wherein the second vehicle further includes an RF receiver to receive the information and the three transmitters in the second vehicle send the known repeating code back to the first vehicle.

15. A system as defined in claim 1, wherein the first vehicle also includes an RF
10 transmitter to send information to the second vehicle, the information including a known repeating code and wherein the second vehicle further includes an RF receiver to receive the information and the transmitter in the second vehicle send the known repeating code back to the first vehicle.

16. A system as defined in claim 15, wherein the RF transmitter in the first vehicle
15 sends RF signals at a different RF frequency than does the RF transmitter in the second vehicle.

17. A system as defined in claim 16, wherein the frequency of the RF signals sent from the first vehicle are in the S-Band and the frequency of the RF signals sent from the second vehicle are in the L-Band.

20 18. A system as defined in claim 16, wherein the frequency of the RF signals sent from the first vehicle compared to the RF signals sent from the second vehicle are a ratio of natural numbers that are each less than 1000.

19. A system as defined in claim 1, wherein the first vehicle also includes a fourth antenna located thereon and a fourth RF receiver contained therewithin and further wherein the second vehicle further includes three more antennas located thereon and three more RF transmitters contained therewithin, the four transmitters transmitting RF signals to each of the
- 5 four receivers and the processor determining, based on the received signals, the relative angular attitudes of the two vehicles.

20. A system for assisting in the automated docking of two space vehicles, one being a target vehicle and the other being a chase vehicle, the system comprising:

three antennas located at spaced-apart positions on the target vehicle;

three antennas located at spaced-apart positions on the chase vehicle;

5 three RF transmitters and one RF receiver contained within a first one of the vehicles, each of the three transmitters being connected to a different one of the three antennas located on the first vehicle, the three transmitters transmitting RF signals via the antennas, and the receiver being connected to one of the three antennas;

three RF receivers and one RF transmitter contained within the second one of the
10 vehicles, each of the three receivers being connected to a different one of the three antennas located on the second vehicle, at least one of the receivers receiving RF signals from the transmitters via the antennas, and the transmitter being connected to one of the three antennas;

a processor receptive of signals received by the receivers in the second vehicle;

15 wherein the transmitter in the second vehicle sends RF signals to the receiver in the first vehicle and then the three transmitters in the first vehicle transmit RF signals via the three antennas on each vehicle to one or more of the three receivers and wherein the processor is operative to determine, based on the received signals, the angular position and attitude of the chase vehicle with respect to the target vehicle.

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21. A system for assisting in the automated docking of two space vehicles, one being a target vehicle and the other being a chase vehicle, the system comprising:

four antennas located at spaced-apart positions on the target vehicle;

four antennas located at spaced-apart positions on the chase vehicle;

5 four RF transmitters and one RF receiver contained within a first one of the vehicles, each of the four transmitters being connected to a different one of the four antennas located on the first vehicle, the four transmitters transmitting RF signals via the antennas, and the receiver being connected to one of the four antennas;

four RF receivers contained within a second one of the vehicles, each of the four
10 receivers being connected to a different one of the four antennas located on the second vehicle, at least one of the receivers receiving RF signals from the transmitters via the antennas, and the transmitter being connected to one of the four antennas;

a processor receptive of signals received by the receivers in the second vehicle;

wherein the transmitter in the second vehicle sends RF signals to the receiver in the
15 first vehicle and then the four transmitters transmit RF signals via the four antennas on each vehicle to one or more of the four receivers and wherein the processor is operative to determine, based on the received signals, the angular position and attitude of the chase vehicle with respect to the target vehicle.

22. A system for accurately determining the position of a maneuverable vehicle relative to an object, the system comprising:

three antennas located at spaced-apart positions on a first one of the maneuverable vehicle and the object;

5 an antenna located on a second one of the maneuverable vehicle and the object;

an RF transmitter located on the second one, the transmitter being connected to the antenna located on the second one, the transmitter transmitting RF signals via the antenna;

three RF receivers located on the first one, each of the three receivers being connected to a different one of the three antennas located on the first one, at least one of the receivers
10 receiving RF signals from the transmitters via the antennas;

a processor receptive of signals received by the receivers;

wherein the transmitter transmits RF signals via the antennas on each of the first one and the second one to one or more of the three receivers and wherein the processor is operative to determine, based on the received signals, the range and angular position of the
15 maneuverable vehicle with respect to the object.

23. A system for assisting in the automated docking of two space vehicles, one being a target vehicle and the other being a chase vehicle, the system comprising:

a plurality of software defined radios on the target vehicle, wherein the software defined radios are controllable to perform the functions of receiving and decoding GPS signal
5 from the constellation of GPS satellites and the functions of transmitting and receiving TDRSS data to and from the constellation of TDRSS satellites;

a plurality of antennas on the target vehicle associated with the plurality of software defined radios on the target vehicle;

a plurality of software defined radios on the chase vehicle, wherein the software
10 defined radios are controllable to perform the functions of receiving and decoding GPS signal from the constellation of GPS satellites and the functions of transmitting and receiving TDRSS data to and from the constellation of TDRSS satellites;

a plurality of antennas on the chase vehicle associated with the plurality of software defined radios on the chase vehicle;

15 wherein the software defined radios on both the target vehicle and the chase vehicle are also controllable to perform a function of determining the range between and the relative angular attitude of the vehicles.

24. A system for assisting in the automated docking of two space vehicles, one being a target vehicle and the other being a chase vehicle, the system comprising:

- one or more antennas located on a first one of the target vehicle and the chase vehicle;
- an antenna located on a second one of the target vehicle and the chase vehicle;
- 5 an RF transmitter contained within the second one of the vehicles, the transmitter being connected to the antenna located on the second vehicle, the transmitter transmitting RF signals via the antenna;
- one or more RF receivers contained within the first one of the vehicles, each of the receivers being connected to a different one of the antennas located on the first vehicle, at
- 10 least one of the receivers receiving RF signals from the transmitters via the antennas;
- a processor receptive of signals received by the receivers;
- wherein the transmitter transmits RF signals via the antennas on each vehicle to the receivers and wherein the processor is operative to determine, based on the received signals, the range and angular position of the chase vehicle with respect to the target vehicle from a
- 15 range of 50 km on into docking.